The first example is as follows. A bun (such as 30" high, 80" long, 60" wide) of high-resiliency polyether-based polyurethane flexible foam is purchased from a foam manufacturer, with an ILD of 50 and a density of 2.8 pounds per cubic foot (considered very durable). A solid foam mattress with an ILD of 50 would be much too firm for the typical consumer. However, the cushion of this example is much softer than a 'solid' slab of 50 ILD foam. Figure 43 shows a cutting pattern 4301. Each line 4302 shows a cut all the way through the width of the bun (i.e., into the paper). These cuts are made by a CNC reciprocal saw such as is made by Baumer USA and is well known in the art. The bun is then turned 90 degrees and cut in a similar fashion as shown in Figure 44 using its cutting pattern 4401. When the bun is disassembled as shown in Figure 45, and the thin disconnected sections are removed, the resulting foam pieces 4501, 4502, 4503, 4504, 4505 and 4506 are bonded together with any of several common foam adhesives to result in the mattress core 4601 of Figure 46. Figure 47 depicts foam side support pieces 4701 having been inserted into receptacles 4702 in all four sides of the foam unit 4703. A cover can then be applied by methods well known in the art. The mattress core has one-piece foam skins which are integral with and which support the many square cross section free-standing columns of square cross section within the core.

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The second example is as follows. A bun (such as 30" high, 80" long, 60" wide) of high-resiliency polyether-based polyurethane flexible foam is purchased from a foam manufacturer, with an ILD of 50 and a density of 2.8 pounds per cubic foot (considered very durable). Figure 51 shows a preferred cutting pattern 5101. Each line shows a cut all the way through the width (into the paper). These cuts are made by a CNC reciprocal saw such as is made by Baumer USA and is well known in the art. This is a simpler pattern, and quicker to cut, than the illustration of the previous example As a further contrast to the previous example, this bun is cut from only one direction rather than turned 90 degrees and cut a second time. When the bun is disassembled as shown in Figure 52, very little is discarded. The resulting foam pieces 5201-5212 are bonded together as shown in Figures 52 and 53 with rails 5201 and 5202 being bonded with any of several common foam adhesives to result in the mattress core of the previous example. A cover is then applied. The mattress core has one-piece foam skins which are integral with and which support the foam free-standing rectangular rail within the core. These are the type of rails described above as effectively having one degree of freedom. While this may reduce the overall effectiveness of the cushion compared to buckling members with multiple degrees of freedom, it is still effective and results in a less expensive mattress to produce because cutting time is reduced and waste is minimized.

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This mattress cushion is capable of high local deformations due to the buckling of the rectangular rails within the cushion. A person lying on his side on this mattress has the feeling that there is no significant pressure on his hips or shoulders, but that his torso is receiving sufficient pressure that sagging of the back does not occur. Figure 54 shows how the rail members 5402 buckle 5403 under the more protruding parts of the body 5401.

This mattress cushion is capable of high local deformations due to the buckling of the rectangular rails within the cushion. A person lying on his side on this mattress has the feeling that there is no significant pressure on his hips or shoulders, but that his torso is receiving sufficient pressure that sagging of the back does not occur. Figure 54 shows how the rail members 5402 buckle [5401] 5403 under the more protruding parts of the body 5401.

Figure 55 shows a 6" tall hollow column gel mattress core 5501. The mattress core 5501 includes foam pieces 5502 stuffed into each outer perimeter cell of the hollow column gel. They are adhesively bonded to an exterior piece of foam through holes 5503 punched in the hollow column gel outer walls. The inner and outer foam pieces are optionally further joined by a cap top and bottom 5504 and 5505, in this case made from foam felt. A fiberglass rod 5506 is inserted through holes punched in the interior walls of the hollow column gel and through the foam pieces stuffed into the outer cells. This rod does not overly interfere with the sitting comfort of the cushion because it is buried so deeply in the soft foam of the border. The rod is very stiff and thus allows lateral pre-tensioning of the hollow column gel. The rod is joined to other rods around the periphery by lugs at the four corners of the hollow column gel.

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Figure 72 depicts a tall gel column 7202 topped with a quilted top 7203 that includes fiber 7201 and foam 7204. The foam creates extra thickness and a bridging effect over the hollow columns, allowing large columns to be used, such as 6" tall, with 1.8" square holes and 0.10" wall thickness. Greater hole size reduces weight and cost of the hollow column gel.

Figure 72 depicts a tall gel column [7002] 7202 topped with a quilted top [7003] 7203 that includes fiber [7001] 7201 and foam [7004] 7204. The foam creates extra thickness and a bridging effect over the hollow columns, allowing large columns to be used, such as 6" tall, with 1.8" square holes and 0.10" wall thickness. Greater hole size reduces weight and cost of the hollow column gel.